

SL Acid Base Review MS (2011 Exam)

1.	D(6)	Legend		Free Response Section (Paper 02)												
2.	C(4)	Level:	Needed	Grade	Possible	3	4	5	6	7				Cutoff		
3.	D(4)	Above +6	0%	2	0	70%	0	50%	0.5	30%	4.8	20%	1.2	10%	0.6	7
4.	D(5)	Above +5	10%	3	0	80%	0	70%	0.7	50%	8	30%	1.8	20%	1.2	12
5.	B(4)	Above +4	20%	4	1	90%	0	80%	0.8	70%	11.2	50%	3	30%	1.8	17
6.	D(5)	Above +3	30%	5	16	100%	0	90%	0.9	80%	12.8	70%	4.2	50%	3	21
7.	C(4)	Above +2	50%	6	6	100%	0	100%	1	90%	14.4	80%	4.8	70%	4.2	24
8.	B(5)	Above +1	70%	7	6	100%	0	100%	1	100%	16	90%	5.4	80%	4.8	27
9.	B(5)	Level	80%	Multiple Choice Section (Paper 01)												
10.	B(5)	Below -1	90%	Grade	Possible	3	4	5	6	7				Cutoff		
11.	D(5)	Below -2	100%	2	0	70%	0	50%	2.5	30%	3.3	20%	0.6	10%	0	6
12.	B(5)	Below -3	100%	3	0	80%	0	70%	3.5	50%	5.5	30%	0.9	20%	0	10
13.	D(6)	Below -4	100%	4	5	90%	0	80%	4	70%	7.7	50%	1.5	30%	0	13
14.	D(5)	Below -5	100%	5	11	100%	0	90%	4.5	80%	8.8	70%	2.1	50%	0	15
15.	A(5)	Below -6	100%	6	3	100%	0	100%	5	90%	9.9	80%	2.4	70%	0	17
16.	D(5)	Below -7	100%	7	0	100%	0	100%	5	100%	11	90%	2.7	80%	0	19

20. Brønsted-Lowry acid:

(5x1)a proton donor;

Lewis acid:

(5x1)electron pair acceptor;

Brønsted-Lowry acid Equation:

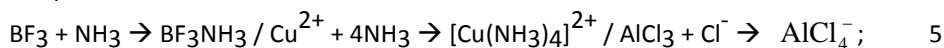
(5x1)Any suitable equation;

Lewis acid Equation:

(6x2)BF₃/AlCl₃/transition metal ions that form complex ion

with ligands;

For example



Or any suitable equation.

[5]

21. (a) (5x1)an acid that partially dissociates/ionizes/doesn't fully dissociate/ionize; 1

(b) (5x2)Any two of the following:

*conductivity - propanoic acid will be lower because lower ion concentration/less dissociated;

*reaction with metal/metal carbonate/metal hydrogencarbonate - propanoic

*acid will react slower/less vigorously because lower [H⁺]/less dissociated;

*reaction with alkali - temperature change will be less for propanoic acid

*because lower [H⁺]/less dissociated; 2

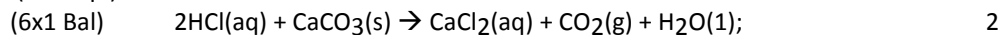
Award [1] mark each for two.

[3]

22. (i) (6x1)bubbling/effervescence/dissolving of CaCO₃/gas given off (do not accept CO₂ produced);

(5x1)more vigorous reaction with HCl/OWTTE; 2

(ii) (5x1 Eqn)



[1] for correct formulas, [1] for balanced, state symbols not essential.

(iii) (4x1)amount of CaCO₃ = $\frac{1.25}{100.09}$ (no penalty for use of 100);

(5x1)amount of HCl = 2×0.0125 = 0.0250 mol (allow ECF);

(6x1)volume of HCl = 0.0167 dm³/16.7 cm³ (allow ECF); 3(iv) (5x1)1:1 ratio of CaCO₃ to CO₂ /use 0.0125 moles CO₂ (allow ECF);(5x1) (0.0125×22.4) = 0.28 dm³/280 cm³/2.8×10⁻⁴ m³ (allow ECF); 2

Accept calculation using pV=nRT.

[9]

23. (5x1) vinegar and factor of 10^5 ; [1]
24. (i) (5x2) Any two of the following:
 *HCl/X is strong and $\text{CH}_3\text{COOH}/\text{Z}$ is weak;
 *HCl/X is fully dissociated and CH_3COOH is slightly dissociated;
 * $[\text{H}^+]$ is greater in HCl/X than in $\text{CH}_3\text{COOH}/\text{Z}$; 2
Any two for [1] each.
- (ii) (5x1) a factor of 100; 1 [3]
25. (i) (6x1) $\text{CH}_3\text{CH}(\text{OH})\text{COOH} + \text{H}_2\text{O} \rightleftharpoons \text{CH}_3\text{CH}(\text{OH})\text{COO}^- + \text{H}_3\text{O}^+$; 1
Ignore state symbols even if incorrect.
The double arrow is necessary for the mark.
- (ii) (7x1) $k_a = \frac{[\text{CH}_3\text{CH}(\text{OH})\text{COO}^-][\text{H}^+]}{[\text{CH}_3\text{CH}(\text{OH})\text{COOH}]}$; 1
Allow $[\text{H}_3\text{O}^+]$ for $[\text{H}^+]$ in the expression.
26. (7x2) resists change in pH; [2]
 when **small** amounts of strong acid or base added to it; 2 [2]
27. (a) (5x1) $(K_w =) [\text{H}^+][\text{OH}^-]$; 1
- (b) (7x3) $[\text{H}^+] = \sqrt{K_w} / \sqrt{5.60 \times 10^{-14}}$; 3
 $= 2.37 \times 10^{-7} \text{ (mol dm}^{-3}\text{)}$
(accept $2.3 - 2.4 \times 10^{-7}$, no significant figure penalty);
(accept 6.60 – 6.63, no significant figure penalty); [4]